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## PREVENTION OF TRANSMISSION

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Human immunodeficiency virus (HIV) infection is presently not curable but theoretically is preventable. Indeed, in the absence of an effective vaccine and curative treatment, prevention of transmission through behavioral interventions represents the major focus for controlling the epidemic of HIV infection. Thus, the need to direct and monitor specific prevention programs for populations at greatest risk for infection has been identified as one of the highest priorities for epidemiologic research (Allen & Curran, 1988).

Studies of the efficacy of counseling and education strategies to modify high-risk behavior have had variable success. To date, the homosexual male population has demonstrated the greatest propensity to change high-risk behaviors. Consistent results from a number of studies in the United States and Great Britain have reported significant changes among this population in high-risk behaviors, such as unprotected anal intercourse and multiple sex partners. There is evidence, though much less striking, that some changes, such as a reduction in needle sharing, have also occurred among intravenous (IV) drug users, the second largest risk group for HIV infection. On the other hand, other studies have reported little change in sexual behavior attributable to concern about HIV infection among young adults, even those in high-risk groups.

Research on the prevention of HIV transmission is a concern of many private and public funding agencies and investigators in several health-care disciplines. For nursing, it is a priority research area because of the direct contact nurses have with high-risk individuals in a variety of settings and because of nursing's focus on primary prevention. The State of the Science and Recommendation sections are divided into two parts: high-risk behaviors and interventions to reduce high-risk behaviors.

### State of the Science

Because health education and counseling are often a responsibility of the nurse, nurses have been particularly interested in the correlation between knowledge and attitudes on the one hand and behavior change on the other. Research has suggested that communication strategies may change knowledge and attitudes but generally have little impact on health behavior. Reasons for differential responses to educational strategies in various subgroups have not been investigated, but could be associated with level of education or other socioeconomic factors, with patterns of disseminating information within certain subcultures and high-risk groups, or with variations in the perceived level of individual risk. The differential responsiveness of populations to education and preventive interventions highlights the need to test various models and theoretical frameworks of behavior change, identify and evaluate the effect of innovative intervention strategies within different populations, assess the duration of behavior change and recidivism

rates when various intervention strategies are used, and examine the impact of changes in knowledge and attitudes on behavior. On a more basic level, the prevalence of risk-taking behaviors in certain subgroups of the population is not well characterized, and target groups for intervention strategies to prevent transmission need to be identified.

### **High-Risk Behaviors**

Research directed toward identifying factors associated with risk of transmitting HIV infection has particular significance at this stage of the epidemic of HIV infection. Because efforts targeted at producing an effective vaccine or a definitive cure are still in the early stages of development, health education and prevention continue to be major lines of defense.

The epidemic of AIDS in the United States has been driven predominantly by men who have sex with men and persons who use IV drugs (Centers for Disease Control [CDC], 1988). This has directed attention to sexual behaviors and patterns of drug abuse in this country. For HIV-related prevention research, the social sciences and not the biomedical sciences have contributed most to the state of knowledge. Further expansion of the understanding of the roles played by sexual and drug use behaviors in HIV transmission will require even greater commitment to and reliance upon the behavioral sciences.

**Sexual Behaviors.** Since the early case reports identifying the first persons with AIDS among homosexual men (CDC, 1981), increasing attention has been directed to the role of various forms of sexual behavior in promoting HIV transmission. Engaging in unprotected sex with multiple partners and engaging in receptive anal intercourse are sexual behaviors associated with the greatest risk of HIV infection (Goedert et al., 1984; Jaffe et al., 1985; Kaslow et al., 1987; Melbye et al., 1984; Melbye et al., 1985). There is also some evidence that the use of nitrites (generally as an aphrodisiac) may be associated with higher rates of cytomegalo-virus infections and higher prevalence rates of Kaposi's sarcoma among HIV-infected individuals (Haverkos, 1987; Newell, Mansell, Spitz, Reuben, & Hersh, 1985). As information is accumulated through investigations of homosexual men, it becomes clear that much more data about HIV-exposing behaviors are needed to construct estimates of the number of persons at risk for infection.

Heterosexual HIV transmission is another area of considerable concern. Persons who acquire HIV infection via sexual contact with a person of the opposite sex represent a small but growing group of AIDS cases reported to the CDC. More than 60 percent of United States-born persons in the CDC heterosexual transmission category reported having an IV drug user as a sex partner (CDC, 1988; Chamberland & Dondero, 1987; Haverkos & Edel-man, 1988). Yet virtually all the accumulated information about heterosexual HIV transmission is based upon investigations in which the index case has met the CDC surveillance definition for AIDS. These studies are distributed predominantly among the following CDC categories of HIV transmission: homosexual/bisexual men, hemophiliacs, or transfusion (Fischl, Dickerson, Scott, Klimas, Fletcher, & Parks, 1987; Harris, Cabradilla, & Robert-Guroff, 1985; Jason et al., 1986; Kreiss, Kitchen, Prince, Kasper & Essex, 1985; Melbye et al., 1985; Padian et al., 1987; Peterman & Curran, 1986; Redfield et al., 1985). Based upon this information, receptive anal intercourse has been the sexual behavior most frequently associated with HIV transmission. There is limited evidence that oral sex is important in transmission, but greater frequency of sexual exposure to HIV-infected persons may enhance the risk for sexual HIV transmission (Mayer et al., 1986; Rozenbaum, Gharakhanian, Cardon, Duval, & Coulaud, 1988; Spitzer & Weiner, 1989).

Heterosexual HIV transmission in the United States might also explain a relatively high female prevalence reported in some HIV serosurveys. In New York City, many studies of IV-drug users demonstrated either higher infection rates among females or no significant differences

between the sexes (Marmor, DesJarlais, Cohen, Friedman, Beatrice, Dubin, El-Sadr, Mildvan, Yancovitz, Mathur, et. al, 1987; Schoenbaum et al., 1986; Weiss et al., 1985). Female IV-drug users, in comparison with male IV-drug users, were more likely to acquire infection by two means: their own IV-drug use and sex with an IV-drug user (Brown & Primm, 1988a, 1988b). This may, in part, be the mechanism underlying the role of any gender-related cofactor in HIV infection/disease among parenteral drug users. More research that focuses on the sex partners of IV-drug users is needed. Given the active role of nurses in drug treatment programs (especially methadone maintenance), nurse investigators are well suited to pursue these investigations. In light of the role that IV-drug users play in heterosexual HIV transmission, the public health significance of such studies is great.

Data from recent studies have suggested that genital herpes simplex, gonorrhea, syphilis, condylomata acuminata and other sexually transmitted diseases (STDs) may be important in the acquisition of HIV infection (Brandt, 1988; Holmberg et al., 1988; Kent, Samuel, & Winkelstein, 1987; Mayer et al., 1986; Moss et al., 1987). It is therefore reasonable to suspect that behaviors that aid or hinder the transmission of STDs may also aid or hinder sexual HIV transmission. If conclusive validation of the foregoing could be obtained, STD statistics may become one surrogate measure of HIV transmission by the sexual route.

The role of prostitution in the epidemic of HIV infection is also of concern (Cohen, Alexander, & Wofsy, 1988; Rosenberg & Weiner, 1988; Van de Perre et al., 1985). The high risk for HIV infection among prostitutes is in part associated with their increased exposure to STDs and their multiple sex partners. However, data strongly suggest that parenteral drug use by prostitutes is a much more significant factor than their sexual habits in HIV transmission (CDC, 1987).

***Psychoactive Substance Use.*** The pervasive role of IV-drug use in the epidemic of HIV infection is unquestioned. Persons who use IV drugs have continued to account for the second largest single transmission category of AIDS cases reported to the CDC (CDC, 1988). The overwhelming contribution of IV-drug use to AIDS cases in the CDC heterosexual transmission category has been mentioned previously. Even more critical is the impact of IV-drug use on the prevalence of AIDS among women, children, and ethnic/racial minorities (Bakeman, McCray, Lumb, Jackson, & Whitley, 1987; Brown & Primm, 1988a; CDC, 1986; Cohen, Hauer, & Wofsy, 1989; Hopkins, 1987; Keller, Schleifer, Bartlett, & Johnson, 1988; Peterson & Bakeman, 1989; Schwarcz & Rutherford, 1989). The role of psycho-active substances in increasing the risk of HIV exposure is of concern.

Increased risk of HIV infection has been associated with needle-sharing (Brown, Murphy, & Primm, 1987; Chaisson, Moss, Onishi, Osmond, & Carlson, 1987; Cohen et al., 1985; Lange et al., 1988; Levy et al., 1986; Robert-Guroof et al., 1986; Weiss et al., 1985), frequency of injection, (Friedland et al., 1985; Kleinman, Friedman, Goldsmith, Mauge, & DesJarlais, 1988; Weiss et al., 1985); duration of IV-drug use (Kleinman et al., 1988); setting (Friedland et al., 1985); and drug treatment modality (Maayan et al., 1985). A significantly lower prevalence of HIV infection among IV drug users with longer periods of enrollment in drug treatment programs has been documented in the literature (Brown, Burkett, & Primm, 1988; Hubbard, Marsden, Cavanaugh, Rachel, & Ginzburg, 1988). However, because most investigations are conducted among IV-drug users enrolled in drug treatment, considerable gaps in knowledge remain with respect to the true prevalence of parenteral drug use and the association between IV-drug use and HIV-exposing sexual behaviors. Data are still too limited to appropriately attribute medical consequences to either the psychoactive substance used or the lifestyle and drug-seeking behaviors associated with procuring the drugs. Under the influence of any given psychoactive substance, some persons may be more likely to engage in HIV-exposing behaviors.

Recent studies demonstrating a risk for HIV infection associated with injecting cocaine (Chaisson et al., 1989; DesJarlais et al. 1987) or administering cocaine through nonintravenous routes (intranasal or inhalation) (Sterk, 1988) raise the question of whether cocaine itself may increase risk of infection. In vitro experiments have shown that some sub-stances such as opiates, alcohol, and marijuana, have immunosuppressive effects. Data from such studies could help elucidate the extent to which psychoactive drugs aid disease progression following HIV infection.

### **Interventions to Reduce High-Risk Behaviors**

Behavioral interventions are presently the principal means of changing high-risk behaviors and, thereby, controlling the spread of HIV. Consequently, one of the highest priorities for epidemiologic nursing research is to determine which intervention programs are most effective, and why (Allen & Curran, 1988).

Significant, and in some instances, dramatic changes in high-risk behaviors have been reported among homosexual males in some United States cities and Great Britain. These changes have included reductions in rates of unprotected anal intercourse and numbers of sex partners (Burton, Burn, Harvey, Mason & McKerrow, 1986; Carne et al., 1987; CDC, 1985; Ekstrand & Coates, 1988; Emmons et al., 1986; Golubjatnikov, Pfeiter, & Tillotson, 1983; Joseph et al., 1987; Martin, 1986/1987; McKusick et al., 1985; McKusick, Hortsman, & Coates, 1985; Stall, McKusick, Wiley, Coates, & Ostrow, 1986; Winkelstein et al., 1987). Reductions in needle-sharing behaviors among IV-drug users have also been reported (Chaisson et al., 1987; DesJarlais, Friedman & Hopkins, 1985; Friedman, DesJarlais, & Sothern, 1986; Ginzburg, French, Jackson, Hartsock, & MacDonald, 1986; Schuster, 1988; Sisk, Hewitt, & Metcalf, 1988).

Heterosexual young adults and adolescents have a high level of awareness about HIV infection, but their risk behaviors do not yet reflect those concerns (DesJarlais et al., 1987; DiClemente, Zorn, & Temoshok, 1986; Hastings, Leather, & Scott, 1987; Kegeles, Adler, & Irwin, 1988; Price, Desmong, Kukulka, 1985; Simkins & Eberhage, 1984; Simkins & Kushner, 1986; Sisk et al., 1988; Strunin & Hingson, 1987; Williams, 1986; Van Servellen, Lewis, & Leake, 1988). Likewise, knowledge of HIV-seropositivity in a group of female IV-drug users had little impact on their decision to continue or terminate pregnancy (Selwyn et al., 1989). The paradigm of knowledge and attitude changes leading to behavior change has been predominant in the health education field. Knowledge and attitudes are generally viewed as necessary conditions for behavioral adherence, but are rarely considered sufficient. The most effective behavioral interventions have applied theory and techniques from at least four disciplines: epidemiology, social/behavioral sciences, administration, and education (Bandura, 1977; Bye, 1988; Green, Kreuter, Deeds, & Partridge, 1980; Iverson, 1984; Parcel & Baranowski, 1981). The body of successful interventions, drawn primarily from the chronic disease field, includes programs designed for school, clinic, work site, and community settings (Editor, 1985; Haynes, Taylor, Sackett, 1979; Mullen, Green, & Persinger, 1985; Sackett & Haynes, 1976; Vincent, Clearie, & Schluchter, 1987).

As the number of successful behavioral interventions grows, theoretical notions about those factors which are most strongly associated with effecting behavior change are gaining validation. There is concern that some such factors may not apply to the HIV prevention effort (Sisk et al., 1988). While effective interventions for smoking and dietary change programs have been reported among a variety of population groups, success rates are often variable. However, Osborn (1988) has pointed out that educational and behavioral interventions in the prevention of HIV infection appear to be more successful than past efforts associated with other conditions. Interventions with homosexual men have included combinations of education about risk

reduction, sexual-assertion training, attention to development of social supports, negotiation skills for safer sex, and peer counseling. These have resulted in significant and sustained changes in behavioral intention and behavior (Kelly, St. Lawrence, Hood, & Brasfield, 1989; Valdiserri et al., 1989).

A variety of prevention strategies currently are being used in efforts to reduce the spread of HIV among IV-drug users and ethnic minorities. These include outreach, education in drug treatment programs, antibody testing, environmental modification, and efforts to prevent initiation of drug use. Friedman, DesJarlais, & Goldsmith (1989) have concluded that current efforts are probably not adequate for this complex problem. The need to use explanatory models with practical utility and ethnic cultural relevance has been recognized (Coates, Stall, Catania, & Kegeles, 1988; National Academy of Sciences, 1989; Schilling et al., 1989).

## **Research Needs and Opportunities**

### **High-Risk Behaviors**

**Sexual behaviors.** Further investigations among prostitutes of either sex may provide additional valuable data to more adequately characterize the relationship between IV-drug use and sexual behavior in HIV transmission. Determinations of the number of prostitutes and the range of sex acts performed by prostitutes are important research efforts to develop a clearer understanding of the contribution of prostitution to HIV transmission.

Further research directed toward interventions to modify behaviors associated with sexually transmitted HIV infection may be a sound investment. The widely communicated recommendations for "safer sex" during the HIV era have also directed renewed attention toward barrier methods of con-traception (Feldblum & Fortney, 1988; Henry, Osterholm, & MacDonald, 1988; Mackintosh, Munday, Fischer, & Morgan, 1986; Ralph, & Spigner, 1986). While a considerable amount is known about the efficacy of these methods to prevent conception, very limited data are available about the efficiency of condoms or spermicides alone in reducing HIV transmission. Less is known about the extent to which these methods interact with other precautions such as discontinuance of insertion sex and the reduction in the number of sex partners, in limiting sexually transmitted HIV infection. Even fewer data are available about the reasons condoms or spermicides are or are not used, or about the factors associated with the improper use of these methods. More research is necessary to determine the efficacy of condoms or spermicides in the reduction of HIV transmission and the extent of condom or spermicide use in various populations. Research should include studies to identify the extent to which current products can be modified to enhance their protectiveness and studies to determine ways to enhance compliance with their use.

**Psychoactive Substance Use.** As with sexual behaviors, more research is needed to determine the prevalence of the use of various psychoactive substances and to understand the HIV risk-associated behaviors linked to the use of these drugs. More epidemiologic studies are necessary to appreciate the sexual, contraceptive, and child-bearing practices of IV-drug users and users of any psychoactive substance. The role of IV drug use is of particular concern because of the increase in perinatal HIV transmission. Mothers of perinatally infected infants are frequently drug users or sexual partners of drug users. A recent study (Selwyn et al., 1989) provided discouraging evidence that infected women in this category are not likely to modify their childbearing practices to prevent perinatal transmission. Finally, greater emphasis is also needed to investigate the inherent effects of various psychoactive substances on the immune, neurologic, and endocrine systems. Behavioral as well as biomedical studies are crucial to education/prevention efforts. Given the critical role of drug abuse in the HIV epidemic, the public health significance can not be over-estimated.

***Transmission in the Health Care Setting.*** Although occupational transmission of HIV infection remains less than 1% following exposure, the rate is increasing (Marcus, 1988). Universal precautions have been recommended by CDC to protect the health care practitioner, but there is evidence that compliance with these practices is less than desirable (Kelen, DeGiovanna, & Kalainov, 1989). For the first time, the Occupational Safety and Health Administration (OSHA) (Department of Labor, 1989) has published draft regulations to mandate universal precautions for protection against bloodborne disease. The extent to which universal precautions are practiced and, subsequently, the effect of these practices and the OSHA regulations on transmission in health care settings, warrant study.

### **Interventions to Reduce High-Risk Behaviors**

Variations in the success of behavioral interventions highlight the need to: test the applicability of effective behavior change models on HIV risk factors, assess the relative effectiveness of these models on different risk groups, and assess the duration of behavior change and factors associated with recidivism. Behavioral interventions are believed to be most effective when they are designed and targeted for specific groups of individuals at increased risk of disease. These groups can be defined by their behaviors (behavior groups), by community identification or affiliation (affiliation groups), or by the settings where education programs can occur (access groups). There is obvious overlap among these groups. Because of the stigmatization that has accompanied efforts to describe population groups at high risk, care should be exercised in defining risk groups.

**Behavior Groups:** Men who have sex with men; IV drug users who share needles; persons disinhibited by alcohol or drugs; persons with multiple sex partners; persons who have sex with infected and/or high-risk persons.

**Affiliation Groups:** Homosexual males; persons with hemophilia; racial minorities; prostitutes; school and college-age youths; childbearing women; sexually abused children; homeless or runaway persons.

**Access Groups:** Health-care workers; in-school youth; health-care service clients; police, fire, emergency responders; church or community organizations; institutionalized populations.

Major research efforts have already been launched to explore behavior change among homosexual males, IV-drug users, and school-age youth. Other populations, such as persons with hemophilia, are small in numbers and receive extensive attention through existing health-care services. Innovative nursing research efforts involving populations that have high levels of need but are not within the mainstream of medical care have a high potential to influence the epidemiology of transmission of HIV infection. Such populations include, but are not limited to, school and college-age youth, sex partners of infected or high-risk persons, especially low socioeconomic minority women, persons working in or receiving care from health-care agencies, prostitutes, and persons who have been institutionalized due to criminal or socially dysfunctional behaviors.

Interventions with high practical utility for study in health care settings include:

- Individual or group counseling and education
- Introduction and reinforcement of policies and procedures related to infection control (e.g., universal precautions)

Health behavior research has been minimal in certain populations, such as prostitutes and

minorities. Nontraditional or innovative strategies to enhance behavior change in some understudied groups should be explored.

A variety of models for behavior change can be applied to studies testing the modification of high-risk behaviors. For example, the Health Belief Model, a forerunner to the contemporary behavior change models, has proved valuable in describing health behaviors (Becker, 1974; Rosenstock, 1966, 1974; Rosenstock, Strecher, & Becker, 1988). Its value as a predictive or intervention change model, though, has been challenged (Haynes et al., 1979). Bandura's Social Learning Theory (1977) and the PRECEDE Model of Green and associates (1980), may be more valuable as intervention planning tools, and have been employed in the AIDS Behavioral Research Project in San Francisco (Bye, 1988). A wide range of studies to enhance patient and health-care worker compliance has been described (Haynes et al., 1979; Sackett & Haynes, 1976). Recidivism rates for tobacco and drug use after treatment are disturbingly high (Leventhal, Prohaska, Hirschman, 1985). It is reasonable to expect similar difficulties in maintaining healthier practices among persons addicted to certain sexual practices (Sisk et al., 1988). The phenomenon of clustered high-risk behaviors among some persons, particularly prevalent among low-income subgroups of the population, represents an additional research challenge.

Before intervention trials can be designed, descriptive epidemiologic studies will be needed to further identify the determinants of high-risk and preventive behaviors, and to identify factors within various theoretical models that are likely to be applicable to the behaviors and populations to be addressed.

## **Recommendations**

Based on the foregoing assessment of research needs and opportunities in "Prevention of Transmission," the Panel has made the following recommendations concerning research in this area over the next five years.

### **High Risk Behaviors**

- Conduct epidemiologic studies to establish prevalence of high-risk practices; for example, prevalence of various types of sex acts performed by prostitutes or inhabitants of correctional systems.
- Identify gender-related cofactors for HIV infection among IV-drug users.
- Determine the extent of condom and spermicide use in high-risk populations, particularly adolescents, persons using psychoactive drugs, persons who engage in sex for money or drugs, and partners of infected individuals.
- Identify determinants of high-risk sexual practices among school and college-age persons, and sexual partners of HIV-infected or high-risk persons, especially minorities, and prostitutes.
- Assess the effects of notification of HIV seropositivity on behavior of infected individuals, their sexual partners, and needle sharers.

### **Interventions to Reduce High Risk Behaviors**

- Identify and test educational or counseling strategies implemented by nurses to enhance behavior change among these populations. Strategies should include factors of proven efficacy in other trials, or application of innovations appropriate to the behaviors and audiences addressed.
- Assess the duration of behavior change and determine rates of and factors associated with recidivism.

- Evaluate nursing interventions to reduce recidivism following behavior change.
- Evaluate efficacy of practices (e.g. universal precautions) of health-care providers to prevent transmission of HIV infection.

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## CHAPTER 2